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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,336	07/29/2003	Hong-Ki Kim	8836-195 (IB12091-US)	6317
22150	7590	11/04/2005	EXAMINER	
F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797			NGUYEN, TUAN H	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 11/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/629,336	KIM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tuan H. Nguyen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,23,25 and 26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,23,25 and 26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/25/05 has been entered.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4, 23, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cho (cited ref.) in view of Jeng (U.S. Pat. No. 6,303,490).

Cho, figs. 4-8 and text on col. 4-7 discloses substantially the claimed capacitor including a lower electrode 24 formed on a semiconductor substrate 20; a dielectric film 25 stacked on the lower electrode 24; and a sequential stack of first TiN upper electrode 26 formed by PVD and a second TiN upper electrode formed by CVD (fig. 6, col. 5, last paragraph to col. 6, first paragraph). Cho, col. 5, lines 40-42 also suggests that the

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invention could be applied to form capacitor with various shapes including to either box shape (convex-type), or crown, cylinder (concave-type).

Cho fails to teach a bias power is applied only to a target when the first upper electrode is formed by PVD as now claimed.

Jeng, in a related method for depositing a conductive layer, teaches the formation of TiN layer 140 and 150 in an opening by PVD, and CVD respectively (figs. 3-4 and related text on col. Last two paragraphs to col. 5, first six lines). The layer 140 is formed by PVD without bias power is added i.e. apply only to the target, not to the substrate (col. 4, lines 58-64).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed capacitor electrode by PVD and CVD for either convex type or concave-type capacitor as suggested by Cho since the substitution of art recognized equivalence as suggested, is within the level of those skilled in the art.

It would also have been obvious to those skill in the art at the time the invention was made to have formed first and second upper electrode of concave-type capacitor by using PVD and CVD respectively wherein no bias power is applied to the substrate when the first upper electrode is formed by PVD as suggested by Jeng in Cho structure since it would form a layer with much smoother surface morphology, lower defect density, and highly (002)-oriented texture.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cho in view of Jeng as applied to claims 1, 2, 4, 23, 25 above, and further in view of Roberts et al..

The combination of Cho and Jeng as explained above, discloses substantially the claimed capacitor, except the formation of anti-reflective layer on the second upper electrode.

Roberts et al., in a related capacitor structure, as shown in fig. 11, teaches the use of anti-reflective layer 75 over the second upper electrode. Note on col. 5, lines 15-23 for the formation of upper electrode by either PVD, CVD, ALD or the combination thereof for forming electrode 60 of any conductive material such as tantalum, tantalum nitride, titanium, titanium nitride, ruthenium... or their combination.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the antireflective layer over the upper capacitor electrode as suggested by Roberts et al. in the concave-type capacitor structure from Cho in view of Jeng for serving as an etch stop and improving optical properties during subsequent photolithography process (col. 5, lines 35-46).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hsu teaches the PVD metal layer in a recess with and without bias power applied to the substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tuan H. Nguyen  
Primary Examiner  
Art Unit 2813